**Program 1:**

clear all;%clear workspace window

close all;%close all window except command window

clc;%clear command window

Am = input("Enter amplitude of the message signal: ");

Fm = input("Enter frequency of the message signal: ");

Ac = input("Enter amplitude of the carrier signal: ");

Fc = input("Enter frequency of the carrier signal: ");

Fs = input("Enter sampling frequency: ");

t = 0:0.001:1;%defining the time range

MI = Am/Ac; %defining modulating index

Mt =Am.\*sin(2\*pi\*Fm\*t);%defining the message signal

Ct =Ac.\*sin(2\*pi\*Fc\*t);%defining the carrier signal wave

St =(1+MI\*Mt).\*Ct;%Amplitude Modulated wave, according to the standard definition

O = St;

%defining a loop for rectification of the modulated signal

for i=1:length(t)

if O(i)<=0

O(i)=0;

end

end

[x,n] = butter(2,2\*pi\*Fm/Fs);%defining butterworth lpf of 2nd order

O1 = filter(x,n,O);

O2 = filter(x,n,O1);

O3 = filter(x,n,O2);

subplot(5,1,1)%plotting the message signal wave

plot(t,Mt);

title("Message Signal");

xlabel("Time(sec)---->");

ylabel("Amplitude--->");

subplot(5,1,2);%plotting the carrier signal wave

plot(t,Ct);

title("Carrier Signal");

xlabel("Time(sec)---->");

ylabel("Amplitude--->");

subplot(5,1,3);%plotting the amplitude modulated wave

plot(t,St);

title("Modulated AM Signal");

xlabel("Time(sec)---->");

ylabel("Amplitude--->");

subplot(5,1,4);%plotting the Rectified modulated wave

plot(t,O);

title("Rectified modulated Signal");

xlabel("Time(sec)---->");

ylabel("Amplitude--->");

subplot(5,1,5);%plotting the demodulated wave

plot(t,O3);

title("Demodulated Signal");

xlabel("Time(sec)---->");

ylabel("Amplitude--->");

**Command Window:**

Enter amplitude of the message signal: 1

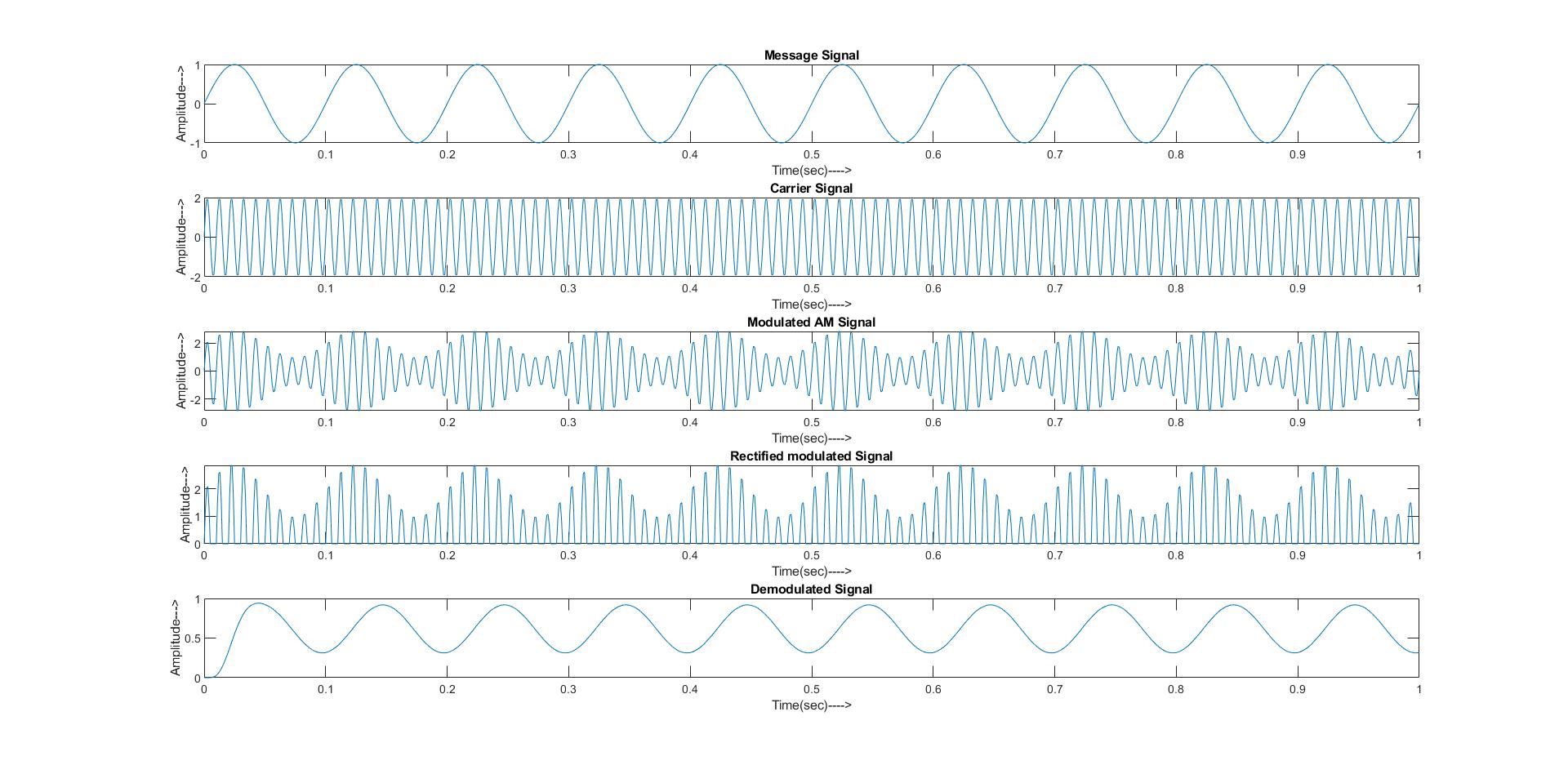
Enter frequency of the message signal: 10

Enter amplitude of the carrier signal: 2

Enter frequency of the carrier signal: 100

Enter sampling frequency: 1000

**Output:**



**Program 2:**

clear all;%clear workspace window

close all;%close all window except command window

clc;%clear command window

Fm = input("Enter frequency of the message signal: ");

Fc = input("Enter frequency of the carrier signal: ");

Fs = input("Enter sampling frequency: ");

T = input("Enter duration over which signal to be plotted: ");

C = input("Enter value of the capacitor of the filter: ");

t = 0:T/Fs:T;%defining the time range

Mt =cos(2\*pi\*Fm\*t);%defining the message signal

Ct =cos(2\*pi\*Fc\*t);%defining the carrier signal wave

St = Mt.\*Ct;%DSB-SC Modulated wave, according to the standard definition

O = St.\*Ct;

R = 1/(2\*pi\*Fm\*C);%defining reactance of the capacitor

H = (1/(R\*C))\*exp(-t/(R\*C));

h = conv(H,conv(O,H));

t1 =t;

for i=length(t)+1:length(h)

t1(i)=0;

end

subplot(4,1,1)%plotting the message signal wave

plot(t,Mt);

title("Message Signal");

xlabel("Time(sec)---->");

ylabel("Amplitude--->");

subplot(4,1,2);%plotting the carrier signal wave

plot(t,Ct);

title("Carrier Signal");

xlabel("Time(sec)---->");

ylabel("Amplitude--->");

subplot(4,1,3);%plotting the modulated wave

plot(t,St);

title("DSB-SC Modulated Signal");

xlabel("Time(sec)---->");

ylabel("Amplitude--->");

subplot(4,1,4);%plotting the demodulated wave

plot(t1,h);

title("Demodulated Signal");

xlabel("Time(sec)---->");

ylabel("Amplitude--->");

**Command Window:**

Enter frequency of the message signal: 10

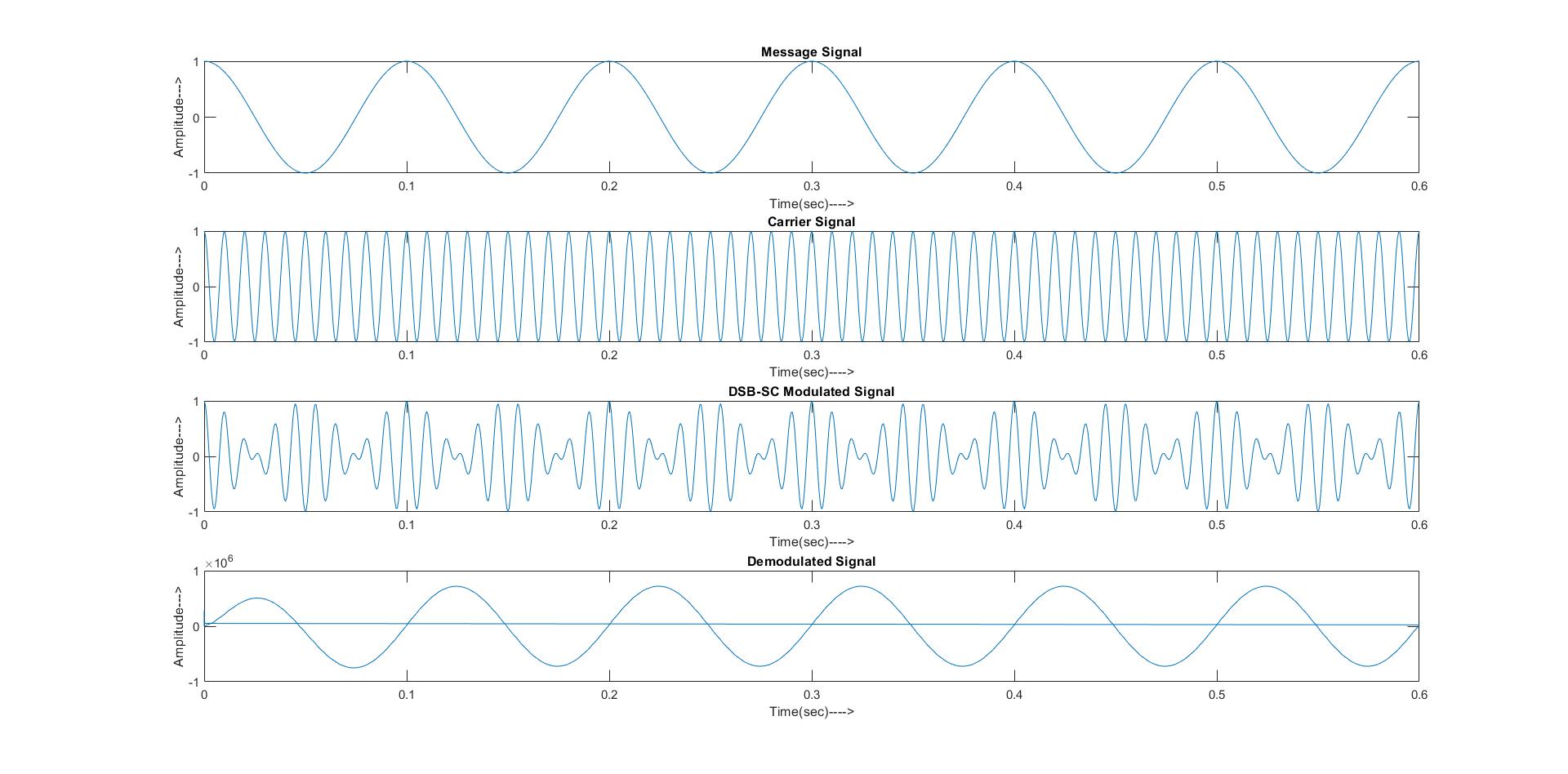
Enter frequency of the carrier signal: 100

Enter sampling frequency: 1000

Enter duration over which signal to be plotted: .6

Enter value of the capacitor of the filter: 1e-8

**Output:**

****

**Program 3:**

clear all;%clear workspace window

close all;%close all window except command window

clc;%clear command window

Fm = input("Enter frequency of the message signal: ");

Fc = input("Enter frequency of the carrier signal: ");

Fs = input("Enter sampling frequency: ");

%defining the time range

t = 0:0.001:0.4;

Mt =cos(2\*pi\*Fm\*t);%defining the message signal

Ct =cos(2\*pi\*Fc\*t);%defining the carrier signal wave

DSB1 = Mt.\*Ct;%DSB-SC Modulated wave

M1 = cos(2\*pi\*Fm\*t - (pi/2));

N1 = cos(2\*pi\*Fc\*t - (pi/2));

DSB2 = M1.\*N1;

USB = DSB1-DSB2;%Generating upper sideband signal

LSB = DSB1+DSB2;%Generating lower sideband signal

USBMult = USB.\*Ct;

%defining butterworth filter

[x,y] = butter(2,(2\*pi\*Fm)/Fs);

F1 = filter(x,y,USBMult);

F2 = filter(x,y,F1);

F3 = filter(x,y,F2);

F4 = filter(x,y,F3);

subplot(5,1,1);%plotting the message signal wave

plot(t,Mt,'k',t,M1,'--b');

title("Baseband signal and its hilbert transform");

xlabel("Time(sec)---->");

ylabel("Amplitude--->");

subplot(5,1,2)%plotting the Carier signal wave

plot(t,Ct,'k',t,N1,'--b');

title("Carrier signal and its hilbert transform");

xlabel("Time(sec)---->");

ylabel("Amplitude--->");

subplot(5,1,3);%plotting Upper side band signal

plot(t,USB);

title("Upper Sideband Signal");

xlabel("Time(sec)---->");

ylabel("Amplitude--->");

subplot(5,1,4);%plotting lower sidea band signal

plot(t,LSB);

title("Lower Sideband Signal");

xlabel("Time(sec)---->");

ylabel("Amplitude--->");

subplot(5,1,5);%plotting the message signal wave

plot(t,F4);

title("Demodulated Signal");

xlabel("Time(sec)---->");

ylabel("Amplitude--->");

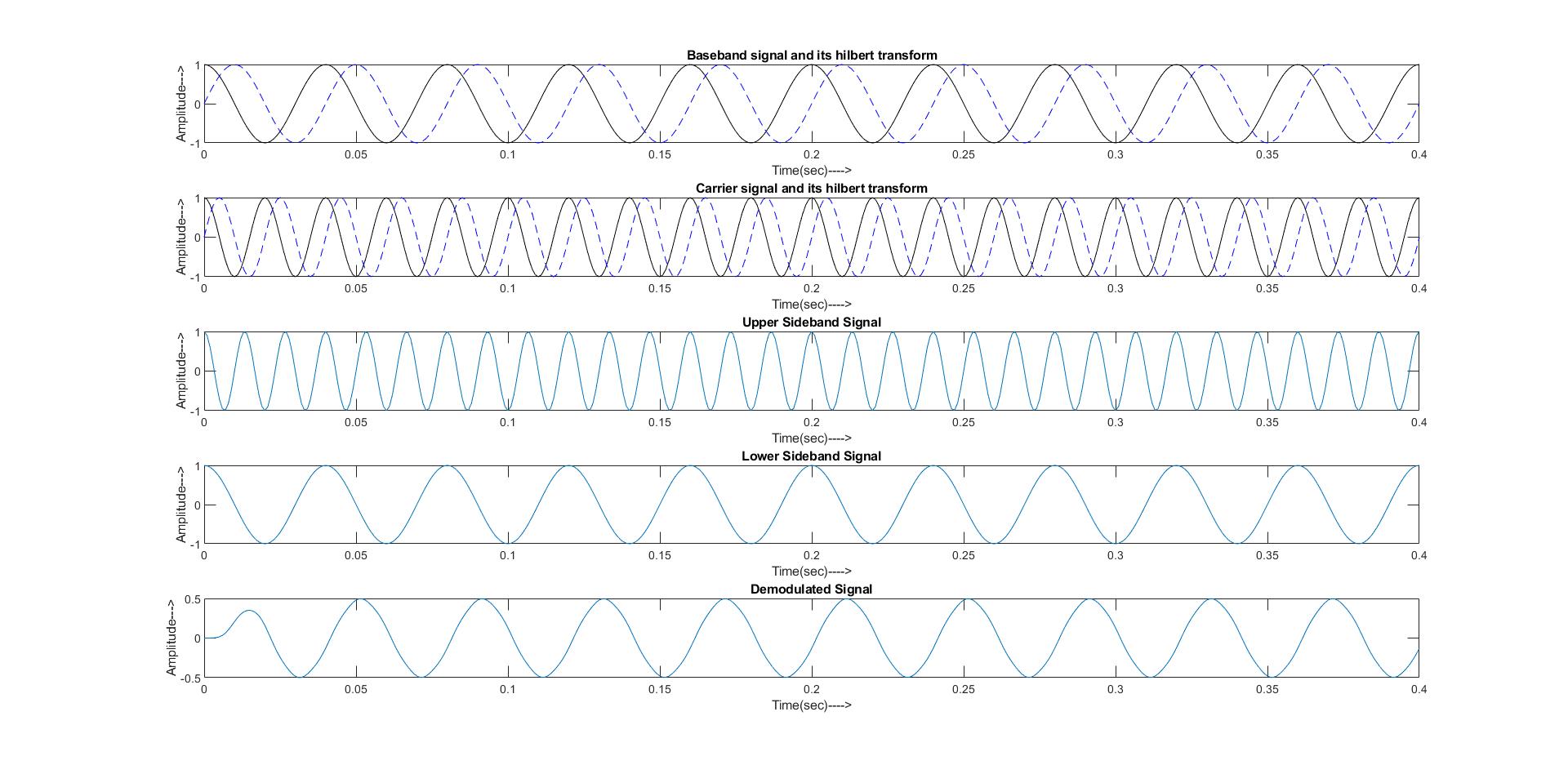
**Command Window:**

Enter frequency of the message signal: 25

Enter frequency of the carrier signal: 50

Enter sampling frequency: 1000

**Output:**



**Program 7:**

clear all; %clear workspace window

close all; %close all window except command window

clc; %clear command window

N = input("Enter the number of sinals to be multiplexed: ");

f = zeros(1,N);

for i = 1:N

f(i) = input("Enter the frequency of the singal: ");

end

fs = 4\*max(f);

T = input("Enter the duration over which the signal to be plotted: ");

t = 0:T/fs:T;

Q = zeros(1, N\*length(t));

R = Q;

S = Q;

for i=1:N

Q(:,((i-1)\*length(t))+1:i\*length(t)) = cos(2\*pi\*f(i)\*t);

end

j = 1;

for i=0:N:length(Q)-N

for n = 1:N

R(i+n) = Q(j+(n-1)\*length(t));

S(j+(n-1)\*length(t))=R(i+n);

end

j = j +1;

end

t1 = 0:T/fs:T;

for i = length(t1)+1:length(Q)

t1(i)=t1(length(t1));

end

subplot(N+2,1,1)%plotting Carrier Signals

plot(t1,Q)

title("Signals to be multiplexed");

xlabel("Time(sec)---->");

ylabel("Amplitude--->");

subplot(N+2,1,2)%plotting Multiplexed Signals

stem(t1,R)

title("Multiplexed Sinals");

xlabel("Time(sec)---->");

ylabel("Amplitude--->");

for i = 1:N

subplot(N+2,1,i+2)%plotting De-Multiplexed Signals

plot(t,S(:,((i-1)\*length(t))+1:i\*length(t)));

title("Demultiplexed Signal");

xlabel("Time(sec)---->");

ylabel("Amplitude--->");

end

**Command Window:**

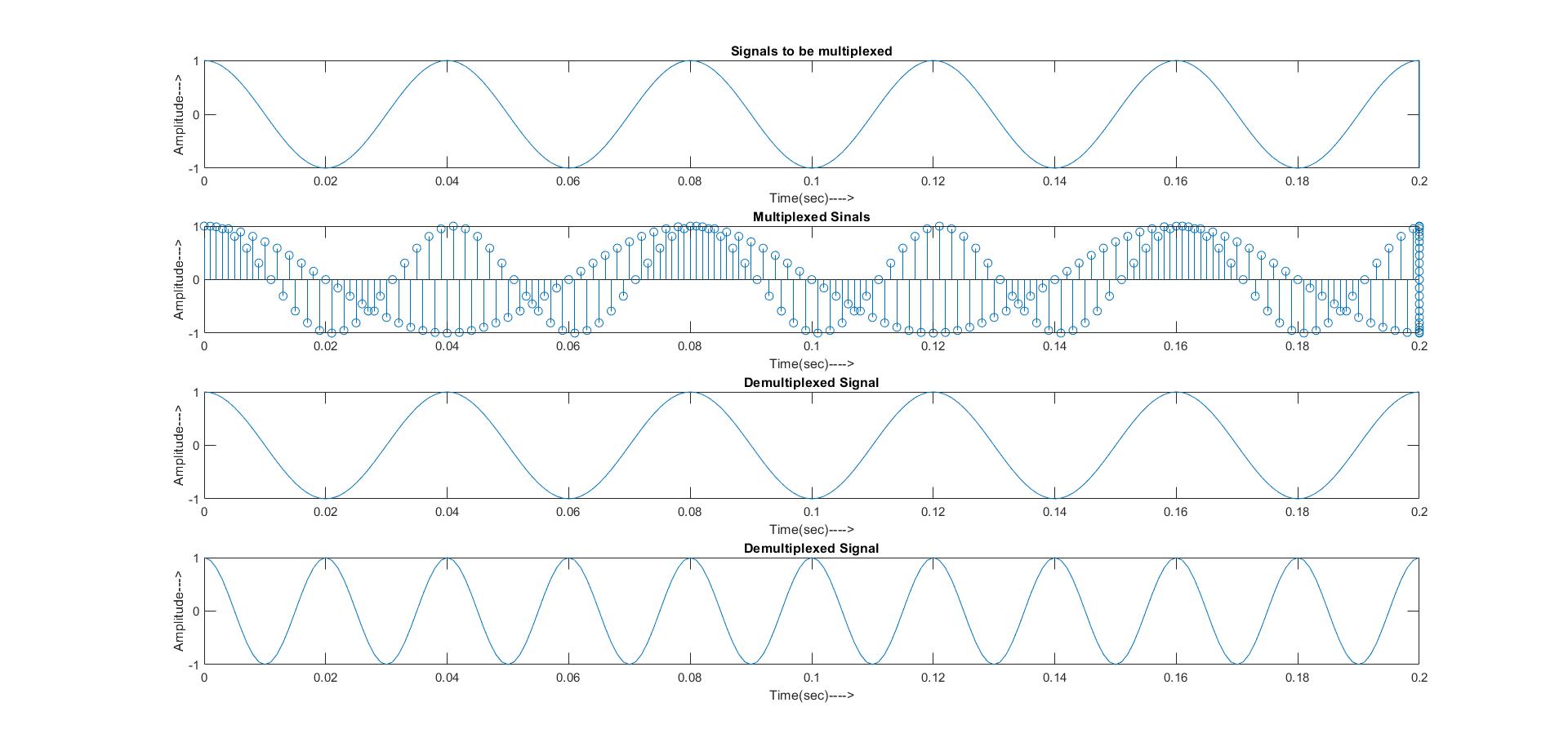
Enter the number of signals to be multiplexed: 2

Enter the frequency of the signal: 25

Enter the frequency of the signal: 50

Enter the duration over which the signal to be plotted: .2

**Output:**

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